Claims

1. An optical transmission system, comprising:

a first transmitter unit;

a first receiver unit;

a first optical transmission path interconnecting the first transmitter unit and the first receiver unit, said first optical transmission path being defined by at least three transmission spans, said first optical transmission path having a periodic dispersion map with a first periodic component comprising a fixed portion and an adjustable portion and a second periodic component greater in length than the first periodic component, said fixed portion of the first periodic component of the periodic dispersion map being provided by the respective transmission spans;

a plurality of optical repeaters each optically coupling adjacent ones of the transmission spans to one another;

a first plurality of adjustable dispersion trimming element each located in one of said optical repeaters and optically coupling one of said transmission spans to an optical amplifier located in said one optical repeater, said first adjustable dispersion trimming elements each having an adjustable path average dispersion that provides said adjustable portion of the first periodic component, said adjustable path average dispersion being selected such that the fixed portion of the first periodic component of the periodic dispersion map plus the adjustable component of the dispersion map associated therewith has a desired value.

2. The optical transmission system of claim 1 wherein at least first and second of the at least three transmission spans define the second periodic component of the dispersion map.

3. The optical transmission system of claim 1 wherein said at least three transmission spans comprises at least four transmission spans, wherein the third and fourth of the transmission spans each have a total path average dispersion different from a path average dispersion of the first and second transmission spans.

4. The optical transmission system of claim 1 wherein the first and second transmission spans plus the dispersion trimming elements respectively constitute the second periodic component of the dispersion map.

5. The optical transmission system of claim 1 further comprising:
a second transmitter unit associated with the first receiver unit;
a second receiver unit associated with the first transmitter unit;
a second optical transmission path interconnecting the second transmitter unit and the second receiver unit, said second optical transmission path being defined by at least three second transmission spans, said second optical transmission path having a periodic dispersion map that is equal to said periodic dispersion map of the first optical transmission path as experienced by an optical signal traveling from the second transmitter unit to the second receiver unit;
wherein said plurality of optical repeaters each include a second adjustable dispersion trimming element each optically coupling one of said second transmission spans to an optical amplifier located in each repeater.

6. The optical transmission system of claim 1 wherein each of the optical repeaters in the plurality of optical repeaters is substantially identical to and interchangeable with one another.

7. The optical transmission system of claim 5 wherein each of the optical repeaters in the plurality of optical repeaters is substantially identical to and interchangeable with one another.

8. The optical transmission system of claim 1 wherein said adjustable dispersion trimming elements each having an adjustable path average dispersion that provides said adjustable portion of the first periodic component, said adjustable path average dispersion being selected such that the fixed portion of the first periodic component of the periodic dispersion map plus the adjustable component of the dispersion map associated therewith has a desired value.

9. The optical transmission system of claim 1 wherein each of the adjustable dispersion trimming elements is coupled to an input of one of the optical amplifiers.

10. The optical transmission system of claim 1 wherein each of the adjustable dispersion trimming elements is coupled to an output of one of the optical amplifiers.

11. The optical transmission system of claim 1 wherein said fixed portion of the periodic dispersion map is approximately equal to zero.

12. The optical transmission system of claim 1 wherein said optical amplifier is a rare-earth doped optical amplifier.

13. The optical transmission system of claim 1 wherein said adjustable dispersion trimming elements comprise spooled optical fiber.

14. The optical transmission system of claim 1 wherein said adjustable dispersion trimming elements comprise a Bragg grating.

15. The optical transmission system of claim 1 wherein at least one of said transmission spans comprises a cabled optical fiber having a single value of dispersion.

16. The optical transmission system of claim 1 wherein at least one of said transmission spans comprises a plurality of cabled optical fibers each having a different value of dispersion.

17. The optical transmission system of claim 8 wherein at least one of said transmission spans comprises a cabled optical fiber having a single value of dispersion.

18. The optical transmission system of claim 12 wherein said spooled optical fiber has a dispersion value substantially greater than said single dispersion value of the cabled optical fiber.

19. A method of establishing a dispersion map for an optical transmission system, having an optical transmission path that includes a plurality of optical amplifiers interconnected by respective transmission spans, said method comprising the steps of: selecting a periodic dispersion map with a first periodic component comprising a fixed portion and an adjustable portion and a second periodic component greater in length than the first periodic component, said fixed portion of the first periodic component of the periodic dispersion map being provided by the respective transmission spans; and

for each given period of the first periodic component, adjusting a path average dispersion to achieve said desired path average dispersion by trimming the second adjustable component associated with the given period.

20. The method of claim 19 wherein said respective transmission spans comprises at least three transmission spans, wherein a first and second of the at least three transmission spans define the second periodic component of the dispersion map.

21. The method of claim 19 wherein said respective transmission spans comprises at least four transmission spans, a third and fourth of the transmission spans each having a total path average dispersion different from a path average dispersion of a first and second of the transmission spans.

22. The method of claim 19 wherein said optical transmission path is a bidirectional transmission path and further comprising a plurality of optical repeaters in which the optical amplifiers are respectively housed, wherein each of the optical repeaters in the plurality of optical repeaters is substantially identical to and interchangeable with one another.

23. The method of claim 19 wherein the adjusting step is performed by at least one adjustable dispersion trimming element associated with one of the optical amplifiers.

24. The method of claim 23 wherein said at least one adjustable dispersion trimming element comprises a plurality of adjustable dispersion trimming elements respectively

associated with the plurality of optical amplifiers and being optically coupled to a respective one of the transmission spans.

25. The method of claim 23 wherein said at least one adjustable dispersion trimming element is located at an input to the optical amplifier.

26. The method of claim 23 wherein said at least one adjustable dispersion trimming element is located at an output to the optical amplifier.

27. The method of claim 19 wherein the adjusting step is performed by at least one adjustable dispersion trimming element associated with one of the optical repeaters.

28. The method of claim 27 wherein said at least one adjustable dispersion trimming element is located at an input to the optical repeater.

29. The method of claim 27 wherein said at least one adjustable dispersion trimming element is located at an output to the optical repeater.

30. The method of claim 19 wherein said first fixed portion of the periodic dispersion map is approximately equal to zero.

31. The method of claim 19 wherein said optical amplifier is a rare-earth doped optical amplifier.

32. The method of claim 27 wherein said adjustable dispersion trimming element comprises spooled optical fiber.

33. The method of claim 27 wherein said adjustable dispersion trimming element comprises a Bragg grating.

34. The method of claim 19 wherein at least one of said transmission spans comprises a cabled optical fiber having a single value of dispersion.

35. The method of claim 19 wherein at least one of said transmission spans comprises a plurality of cabled optical fibers each having a different value of dispersion.

36. The method of claim 32 wherein at least one of said transmission spans comprises a cabled optical fiber having a single value of dispersion.

37. The method of claim 36 wherein said spooled optical fiber has a dispersion value substantially greater than said single dispersion value of the cabled optical fiber.

38. A method of assembling an optical transmission system, said method comprising the steps of:
providing a plurality of optical repeaters each having an input and output, each of said repeaters including an optical amplifier and an adjustable dispersion trimming element;
providing a plurality of spans of cabled optical fiber;
optically coupling the input and output of each of the repeaters to an end of one of the spans of cabled optical fiber to form a transmission path having a concatenation of optical repeaters such that each of the spans of cabled optical fiber is associated with one of the adjustable dispersion trimming elements; and
adjusting a path average dispersion of the adjustable dispersion trimming elements to achieve a desired total path average dispersion for the cabled optical fiber span and the adjustable trimming element associated therewith.

39. The method of claim 38 wherein each of said optical repeaters are substantially identical to and interchangeable with one another.

40. The method of claim 39 wherein at least two of cabled fiber spans have dispersion values that differ from one another.

41. The method of claim 38 wherein said transmission path has a dispersion map with a period equal to one of the spans of cabled optical fiber plus the adjustable dispersion trimming element associated therewith.

42. The method of claim 38 wherein said transmission path has a dispersion map with a period greater than one of the spans of cabled optical fiber plus the adjustable dispersion trimming element associated therewith.

43. The method of claim 39 wherein said transmission path has a dispersion map with a period equal to one of the spans of cabled optical fiber plus the adjustable dispersion trimming element associated therewith.

44. The method of claim 39 wherein said transmission path has a dispersion map with a period greater than one of the spans of cabled optical fiber plus the adjustable dispersion trimming element associated therewith.

45. The method of claim 38 wherein said adjustable dispersion trimming elements are respectively located at the inputs to the optical repeaters.

46. The method of claim 38 wherein said adjustable dispersion trimming elements are respectively at the outputs to the optical repeaters.

47. The method of claim 38 wherein said optical amplifiers are rare-earth doped optical amplifiers.

48. The method of claim 38 wherein said adjustable dispersion trimming elements comprise spooled optical fibers.

49. The method of claim 38 wherein said adjustable dispersion trimming elements comprise Bragg gratings.

50. The method of claim 38 wherein at least one of said spans of cabled optical fiber comprises a cabled optical fiber having a single value of dispersion.

51. The method of claim 38 wherein at least one of said spans of cabled optical fiber comprises a plurality of cabled optical fibers each having a different value of dispersion.

52. The method of claim 48 wherein at least one of said spans of cabled optical fiber comprises a cabled optical fiber having a single value of dispersion.

53. The method of claim 52 wherein said spooled optical fiber has a dispersion value substantially greater than said single dispersion value of the cabled optical fiber.